2019

MASSACHUSETTS CLEAN ENERGY CENTER®

Massachusetts **Clean Energy Industry Report**

[bw] RESEARCH PARTNERSHIP

MassCEC Wind Technology Testing Center, Charlestown

About MassCEC

The Massachusetts Clean Energy Center (MassCEC) is a quasi-public state agency dedicated to growing the state's clean energy economy while helping the Commonwealth meet its ambitious clean energy, climate and economic development goals. MassCEC works to increase the adoption of clean energy while driving down costs and delivering financial, environmental, and economic benefits to utility customers across the state.

MassCEC has utilized innovative programming to advance the clean energy industry in Massachusetts, including incentives for clean energy technology installations, financing for early stage companies and technology development, as well as investments in training programs to build a clean energy workforce. MassCEC works to drive innovation by serving as a test bed and support center for the clean energy technology sector, providing assistance to enable companies to access capital and other vital growth resources.

SINCE ITS INCEPTION IN 2009, MASSCEC HAS:

- > Invested over **$300 million** in the clean energy industry
- > Supported over **45,000** clean energy systems
- > Leveraged over **$2 billion** in private capital
- > Awarded over **$60 million** to low- and moderate-income residents
- > Supported over **3,600** internships for students at clean energy companies
- > Invested **$120 million** to support clean energy innovation

MassCEC fosters collaboration among the industry, state government, research universities and the financial sector to advance the state's clean energy economy. We partner with a diverse range of stakeholders across the industry, including the innovators who are developing the next generation of clean energy technologies and solutions.

MassCEC constructed and operates the Wind Technology Testing Center and the New Bedford Marine Commerce Terminal. Massachusetts Energy and Environmental Affairs Secretary Kathleen Theoharides chairs MassCEC's board of directors.

STEPHEN PIKE - CEO

Massachusetts has worked hard to earn its reputation as a national hub for innovation and clean energy development. As the United States continues its transition to a clean energy future, the Commonwealth has championed nation-leading policies, aggressive commitments to reduce greenhouse gas emissions, and fostered an ecosystem of innovation that is creating jobs in our state while advancing solutions to the most daunting energy challenges nationwide.

Each year the Massachusetts Clean Energy Center (MassCEC) measures the development of the Commonwealth's clean energy industry, and this year marks the ninth consecutive year of growth. Massachusetts' clean energy industry reached more than 111,800 workers statewide, representing 3.1 percent of the state's workforce. Clean energy employment has increased by 86 percent since 2010, with nearly 52,000 new clean energy workers over that period.

The clean energy industry also increased its contribution to the Commonwealth's Gross State Product (GSP), with the nearly $14 billion industry representing a 2.5 percent share of GSP.

As the industry builds on the progress of the last decade, the outlook for clean energy is strong. In 2019, the Massachusetts Executive Office of Energy and Environmental Affairs released its Global Warming Solutions Act 10 Year Progress Report, which found that major gains in energy efficiency - combined with significant progress in diversifying the state's energy portfolio - has the state on track to meet its 2020 benchmark for greenhouse gas (GHG) emissions reduction. The Baker-Polito Administration also released its Comprehensive Energy Plan, which outlined policy recommendations to help the Commonwealth meet its long-term greenhouse gas reduction targets. The report identified the need to make dramatic greenhouse gas reductions in the transportation and buildings sectors, to continue the state's ongoing transition to renewable generation assets and to develop an electric grid that enables the Commonwealth to achieve its 2050 greenhouse gas reduction goal.

Over the last year, MassCEC continued its support of Massachusetts' nation-leading innovation cluster, building on our longstanding strategic relationships with clean energy incubators and accelerators, providing critical resources to startups across the Commonwealth; launched new programs to support energy efficient affordable housing design and construction; partnered with communities to lower the cost of clean energy technologies; and announced funding to establish training programs at six academic institutions and labor organizations, which will lay the groundwork for a broad-based network for offshore wind workforce training in Massachusetts that will ready the workers and build this industry in the North American marketplace.

Massachusetts has made tremendous progress toward its clean energy and climate goals, but the challenge in the coming years is significant. MassCEC is well suited to help the Commonwealth develop solutions within priority sectors and meet the challenges posed by climate change. MassCEC will continue to work closely with our partners in the clean energy industry to understand its challenges in a shifting marketplace and identify opportunities to address barriers to progress. We remain focused on using our resources in the most efficient way possible to help this industry sustain and build on its remarkable progress over the last decade. We continue to rely on your support as we build a vibrant, durable clean energy industry that will grow the state's innovation economy and help Massachusetts meet the challenge of climate change.

STEPHEN PIKE
CEO, Massachusetts Clean Energy Center

Passive House Apartments,
Distillery North, Boston

Wind Project, Jiminy Peak, Hancock

2019 MASSACHUSETTS Clean Energy Industry Highlights

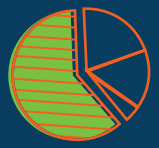
There are **111,836** clean energy workers in MA in 2019, a **1%** increase from 2018

Clean energy companies represent nearly **$14 billion** in MA Gross State Product, up **$4.8 billion** since 2013

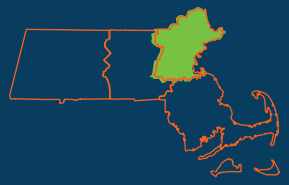
Clean energy jobs make up **3.1%** of all jobs in MA

9 CONSECUTIVE YEARS OF JOB GROWTH

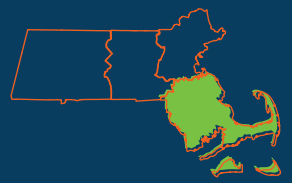
The clean energy industry in MA has added nearly **52,000** new workers since 2010, representing **86%** job growth



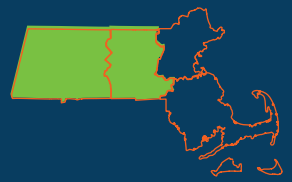
61% of clean energy workers in MA are employed by small businesses



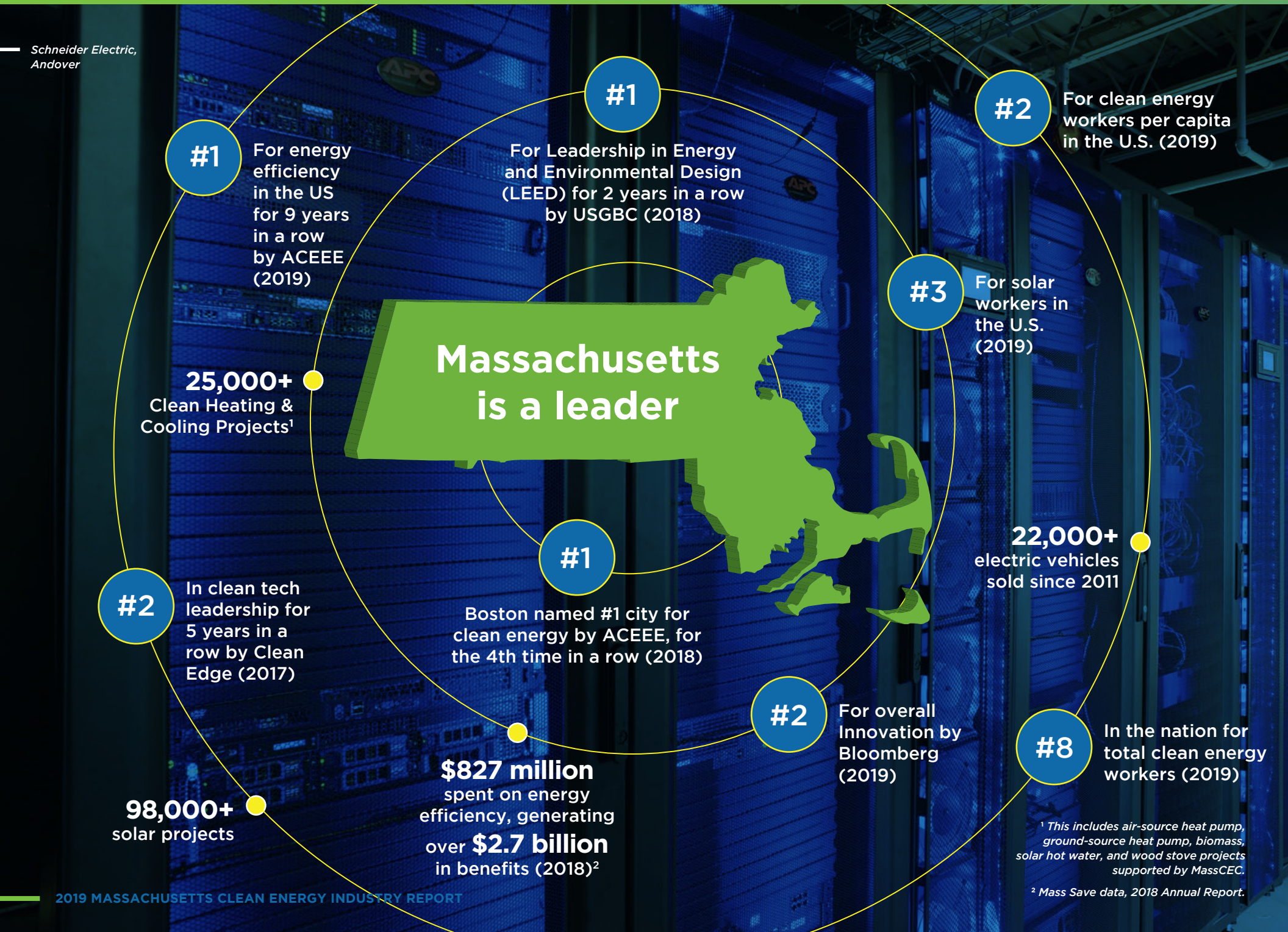
The Northeast region of MA employs **48%** of the Commonwealth's clean energy workers and contains **45%** of the clean energy businesses in the state



The Southeast region of MA experienced **1.5%** clean energy job growth since 2018, the highest rate of all regions



The Central region of MA has the highest concentration of clean energy jobs at **4.1%** of its workforce, followed by the **Western region** at **3.5%**



Schneider Electric, Andover

Massachusetts is a leader

#1 For energy efficiency in the US for 9 years in a row by ACEEE (2019)

#1 For Leadership in Energy and Environmental Design (LEED) for 2 years in a row by USGBC (2018)

#2 For clean energy workers per capita in the U.S. (2019)

#3 For solar workers in the U.S. (2019)

25,000+ Clean Heating & Cooling Projects[1]

22,000+ electric vehicles sold since 2011

#1 Boston named #1 city for clean energy by ACEEE, for the 4th time in a row (2018)

#2 In clean tech leadership for 5 years in a row by Clean Edge (2017)

#2 For overall Innovation by Bloomberg (2019)

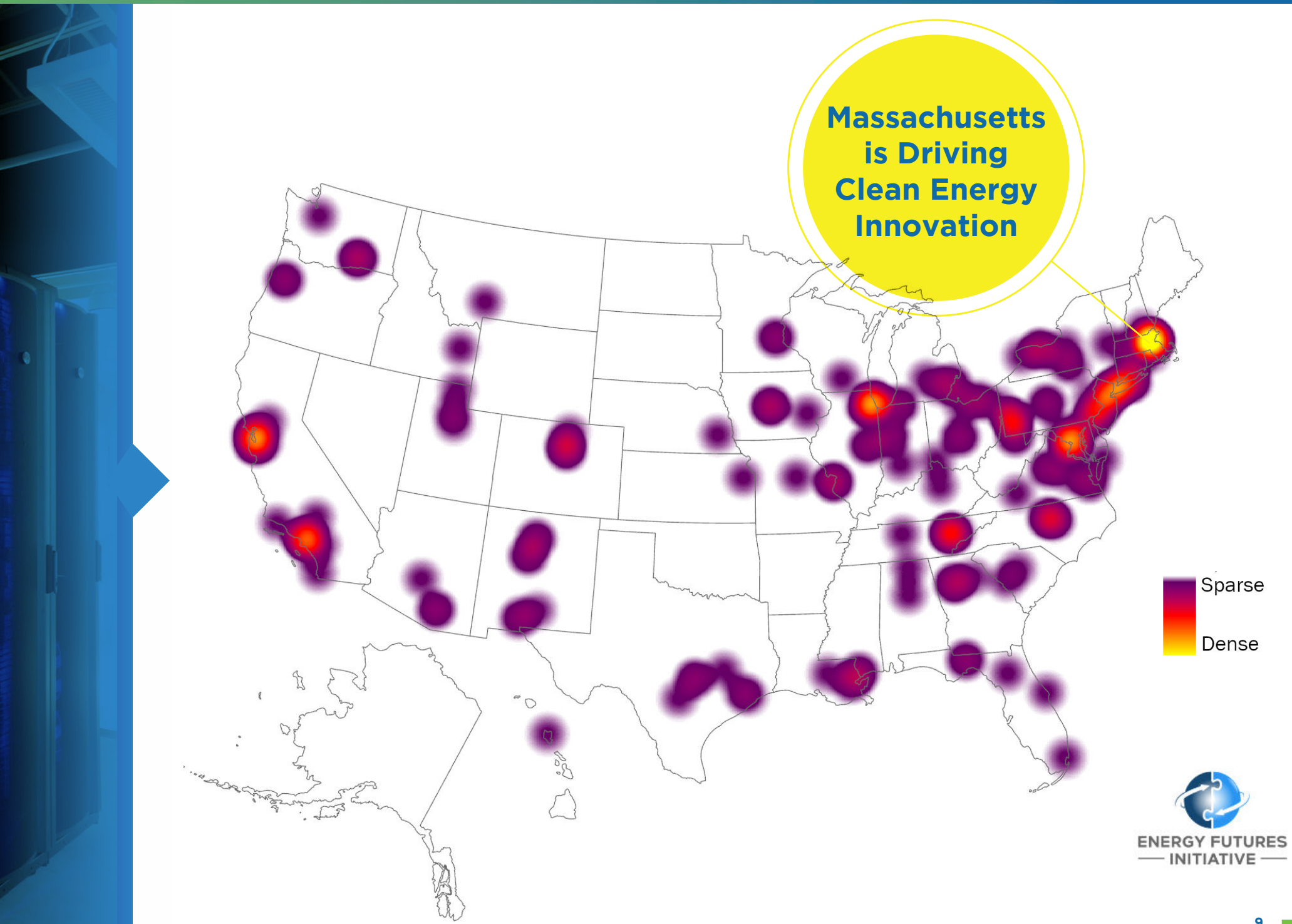
#8 In the nation for total clean energy workers (2019)

$827 million spent on energy efficiency, generating over **$2.7 billion** in benefits (2018)[2]

98,000+ solar projects

[1] This includes air-source heat pump, ground-source heat pump, biomass, solar hot water, and wood stove projects supported by MassCEC.

[2] Mass Save data, 2018 Annual Report.

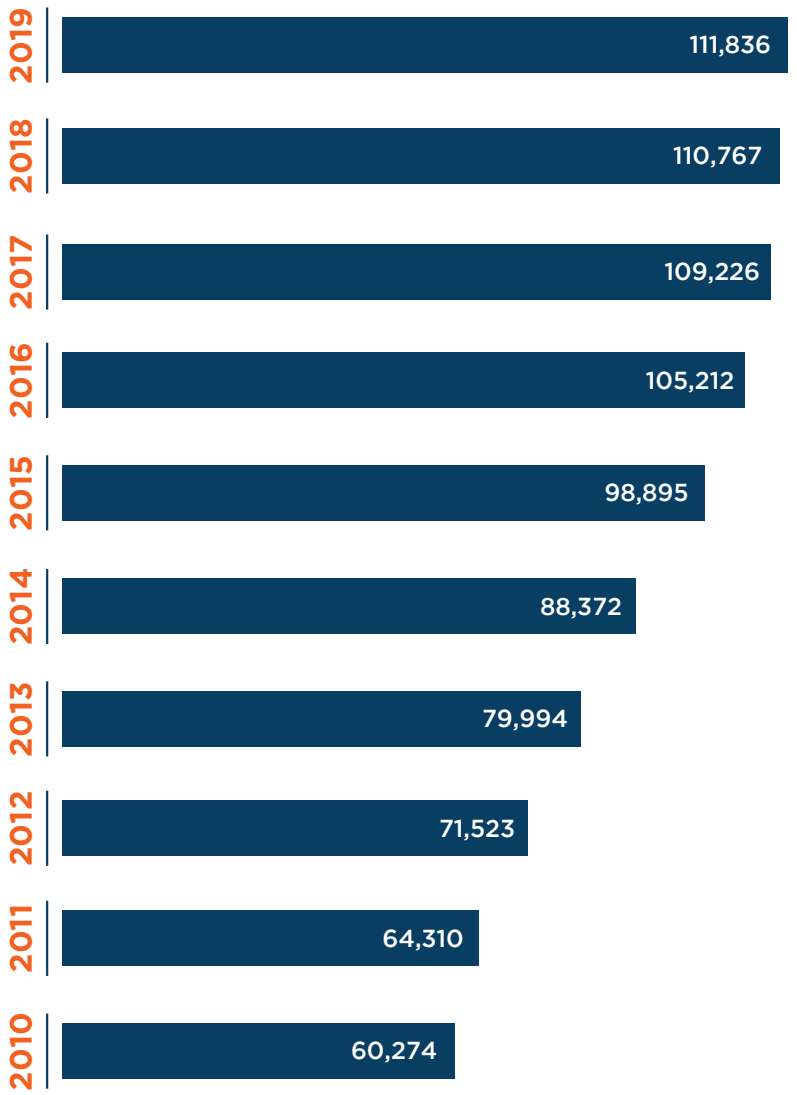

Massachusetts is Driving Clean Energy Innovation
Sparse
Dense
ENERGY FUTURES INITIATIVE

Total Clean Energy Jobs
2010-2019

This report defines a clean energy worker as a person who spends some portion of their time working in renewable energy, energy efficiency, alternative transportation, or other carbon management technologies.

The clean energy industry in Massachusetts has added almost **52,000** jobs since 2010, which accounts for **11.5%** of all jobs created in the state during that time.

Clean energy jobs in Massachusetts represent **3.1%** of all jobs in the state, and account for **3.4%** of all clean energy jobs in the United States.



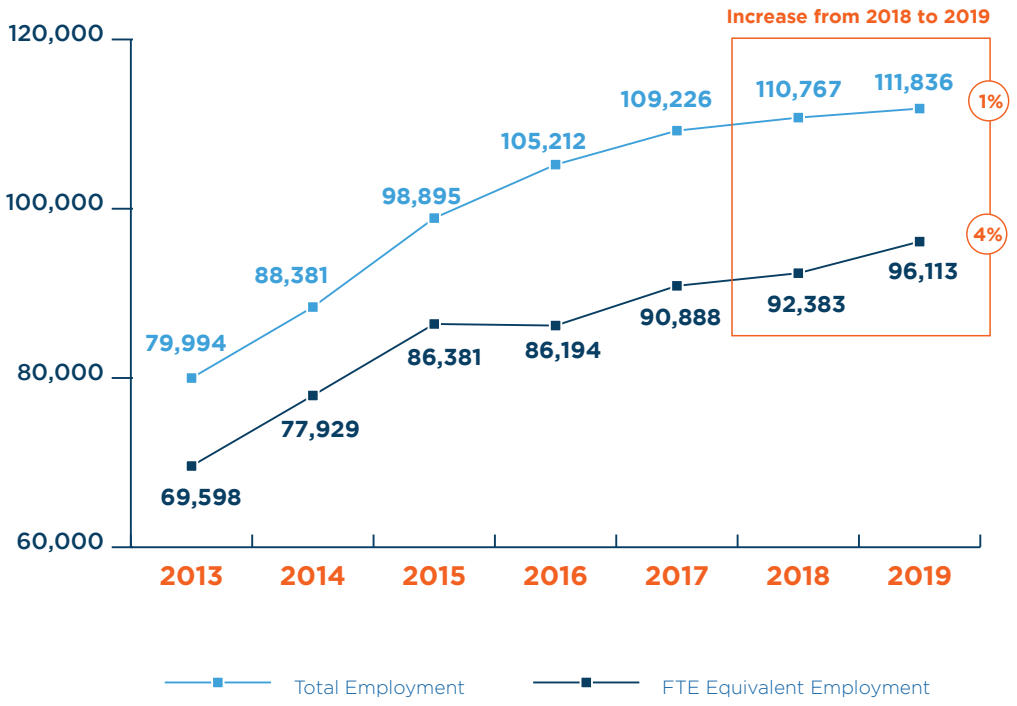
86%
job growth since 2010

Students at Greater Lawrence Technical School, Andover

Equivalent Full-Time Employment Jobs 2013-2019

This year a new employment intensity metric was applied, which approximates full-time employment (FTE) equivalent jobs. This metric shows that while overall job numbers (regardless of the percentage of time individuals spend on clean energy work) increased by **1%**, the number of FTE equivalent jobs increased by **4%** from 2018 to 2019. This indicates that employees are spending more of their time on clean energy work in the state.

From 2016 to 2019, FTE equivalent clean energy employment grew **11.5%**, nearly doubling the **6.3%** growth of overall clean energy employment over the same period.



7,380 Clean Energy Businesses in 2019

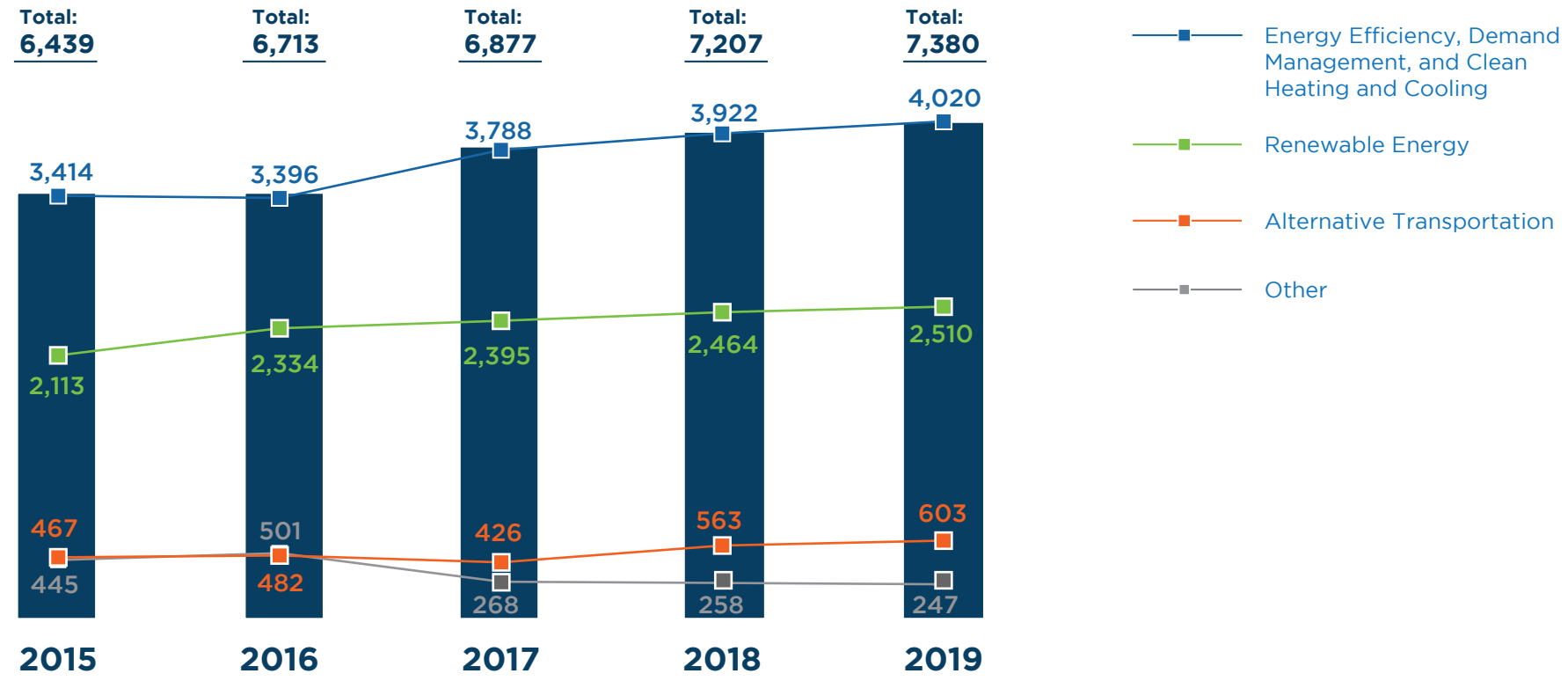
Solar, MassCEC Wind Technology Testing Center, Charlestown, Photo Courtesy of Mike Condon

Clean Energy Businesses

In 2019, **55%** of the clean energy businesses in Massachusetts are focused on Energy Efficiency, Demand Management, and Clean Heating and Cooling, which is a **2%** increase over 2018. The number of Alternative Transportation businesses increased by **7%** over the same time period.

Small businesses (1 to 10 employees) employ nearly **61%** of all clean energy workers, followed by mid-size businesses (11 to 49 employees) that employ over **25%** of clean energy workers.

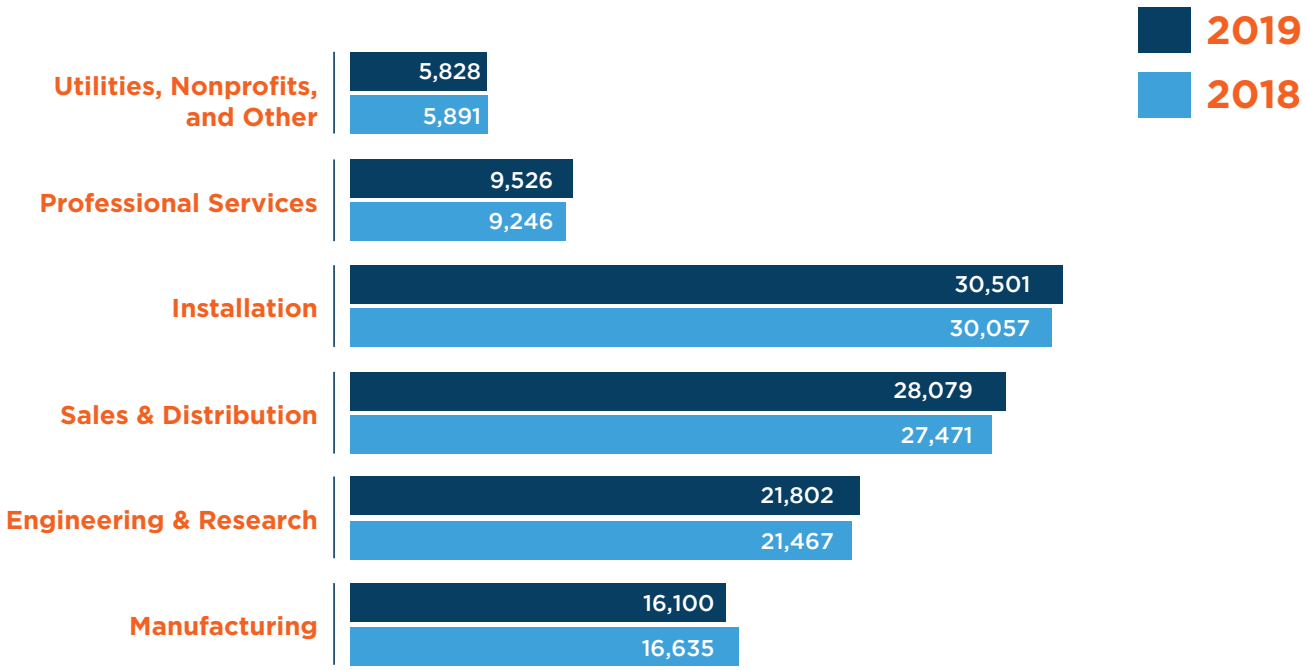
Massachusetts Clean Energy Businesses



Clean Energy Jobs By Value Chain

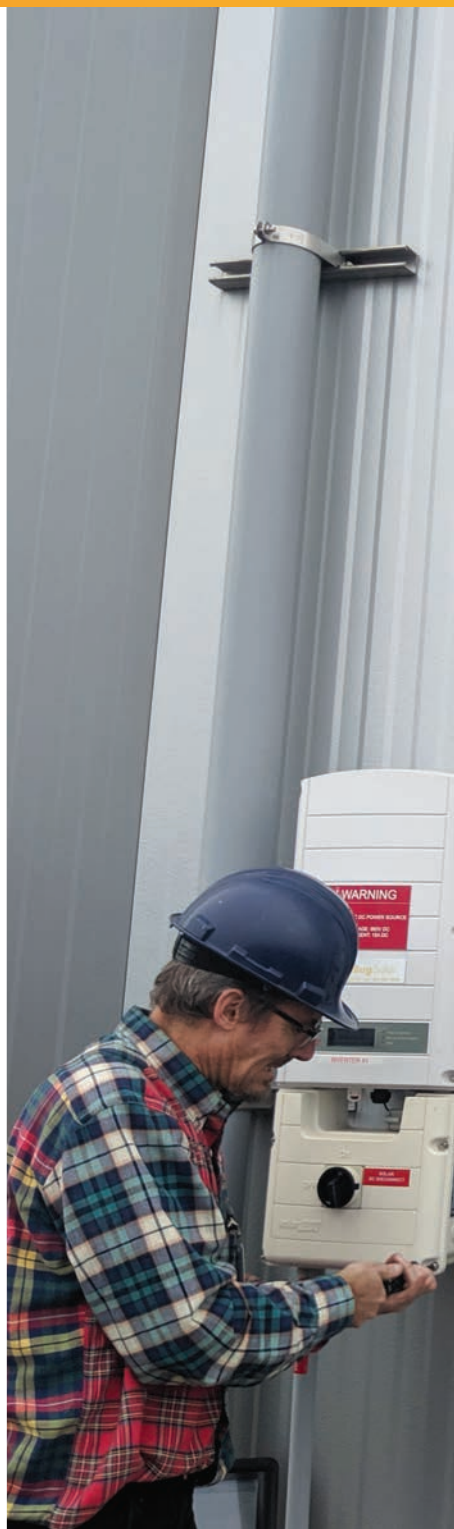
Professional Services[3] saw the largest growth rate of the clean energy value chain with a **3%** increase between 2018 to 2019.

The 2019 decline in Manufacturing jobs can be partially attributed to an overall **1%** decline in manufacturing across Massachusetts.[4]



[3] *Any sort of finance, legal, architecture, or other mathematical or scientific service that supports clean energy technology development and deployment.*

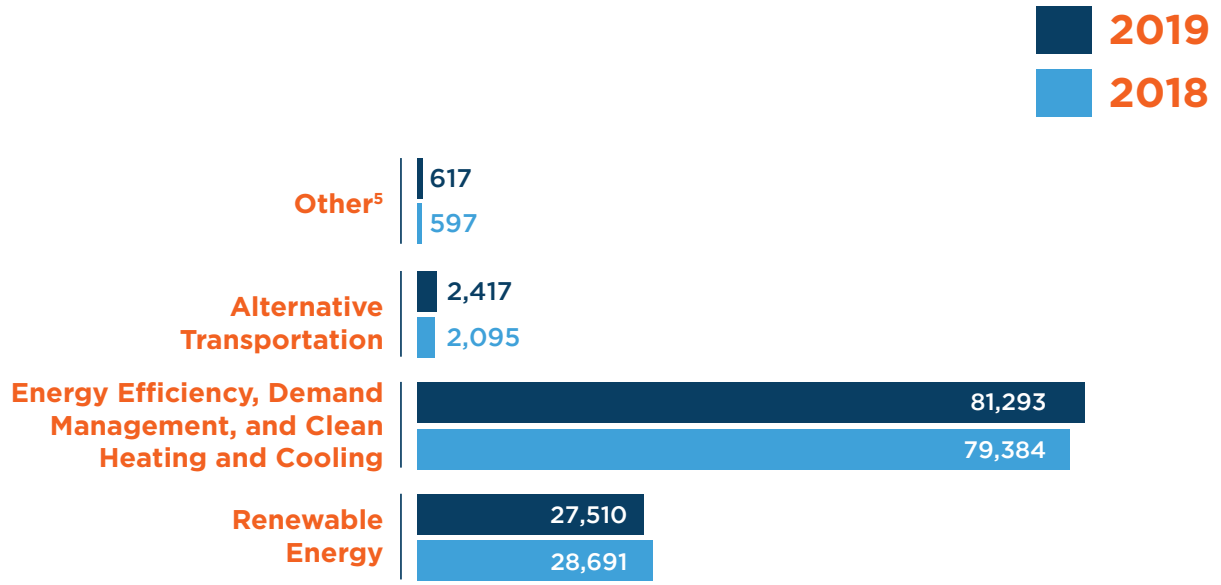
[4] *Source: Emsi. 2019.3*



Solar Inverters, MassCEC Wind Technology Testing Center, Charlestown, Photo courtesy of Mike Condon

Clean Energy Jobs By Sector

Energy Efficiency, Demand Management, and Clean Heating and Cooling remains the largest clean energy sector, growing jobs by over **2%** from 2018 to 2019. Alternative Transportation saw the greatest proportional job growth at **15%**, and Renewable Energy employment declined by about **4%** over 2018.

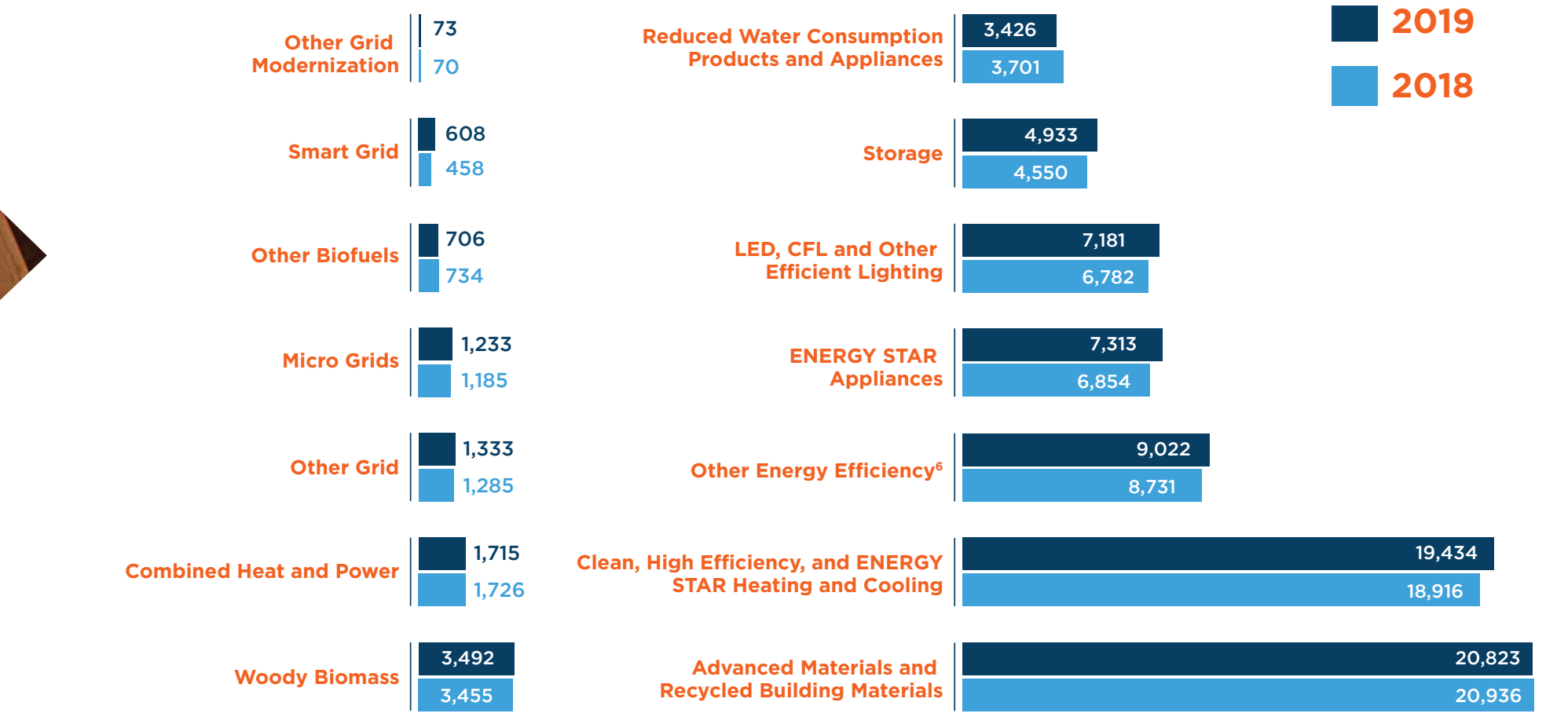


[5] *'Other' consists of all jobs that could not be classified.*

Energy Efficiency Worker, photo courtesy of Eversource

Energy Efficiency, Demand Management, and Clean Heating and Cooling Jobs

Energy Efficiency, Demand Management, and Clean Heating and Cooling jobs make up the largest portion of clean energy jobs within Massachusetts. Clean, High Efficiency, and ENERGY STAR Heating and Cooling saw the largest increase, with over **500** jobs being added in 2019, followed by ENERGY STAR Appliances with about **460** jobs, LED, CFL, and Other Efficient Lighting with almost **400** jobs, and Storage with over **380** additional jobs.

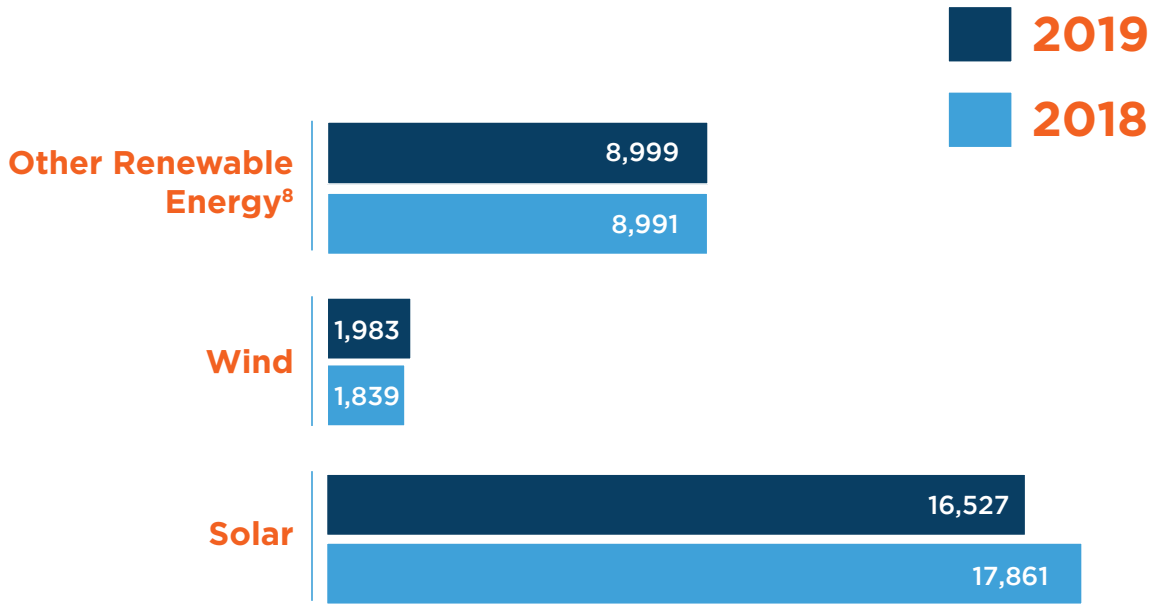


[6] *Other Energy Efficiency includes variable speed pumps, other design services, software, energy auditing, rating, monitoring, metering, leak detection, LEED certification, phase-change materials, or all other activities not specific to a detailed technology.*

Renewable Energy Jobs

The solar workforce declined by roughly **7%** following national trends toward more labor efficient business models and reduced door-to-door sales. Massachusetts continues to be a national solar industry leader and is ranked **3rd** for the most solar employees and **7th** for the most solar workers per capita.[7]

Wind energy generation employment in Massachusetts has grown steadily over the past three years. Resulting from the historic legislation passed by the legislature and signed by Governor Baker in 2016, Massachusetts has selected two offshore wind projects totalling **1,600 MW**, with an overall goal of **3,200 MW** installed by 2035.



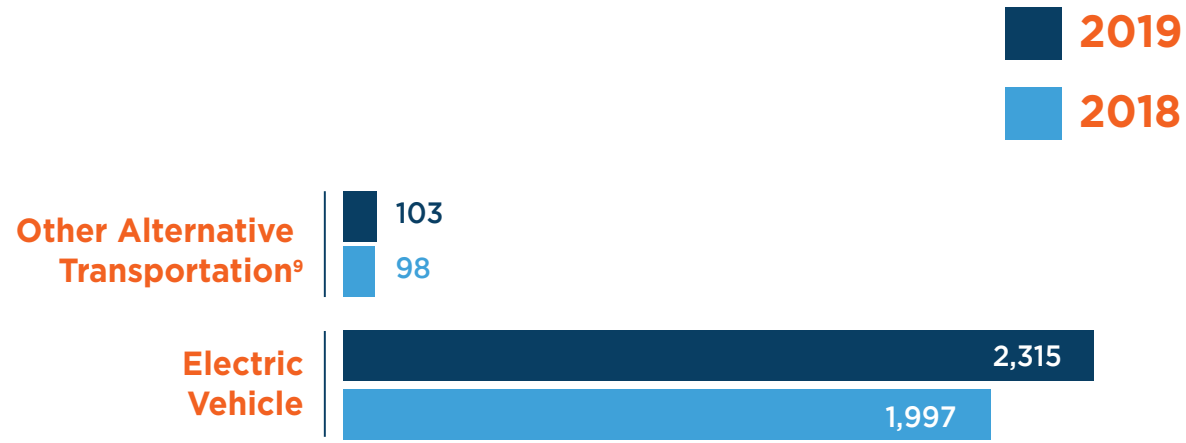
[7] *The Solar Foundation. National Solar Jobs Census 2018.*

[8] *Other Renewable Energy includes Geothermal, Bioenergy/Biomass, Low-Impact Hydro, and all other electric power generation detailed technologies that are not defined by the categories presented or cannot be assigned to a single category.*

Electric Vehicle and Charging Station, Schneider Electric, Andover

Alternative Transportation Jobs

Transportation emissions account for roughly **43%** of overall greenhouse gas emissions in Massachusetts. It is anticipated that Alternative Transportation jobs will continue to grow as this sector expands. Individual vehicle sales are also helping to spur economic activity, with over **22,000** electric vehicles registered in Massachusetts.

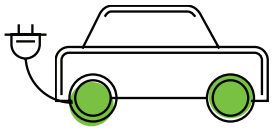


[9] *Other Alternative Transportation includes jobs around technologies such as biodiesel for on-road vehicles.*

Top Five Fastest Growing Sub-sectors
2018-2019

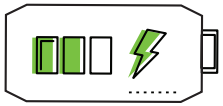
Smart Grid jobs grew by almost

33%



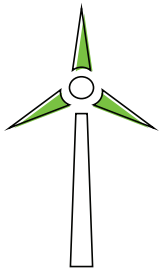
Electric Vehicle jobs grew by almost

16%



Storage jobs grew by over

8%



Wind jobs grew by almost

8%

ENERGY STAR Appliance jobs grew by almost

7%

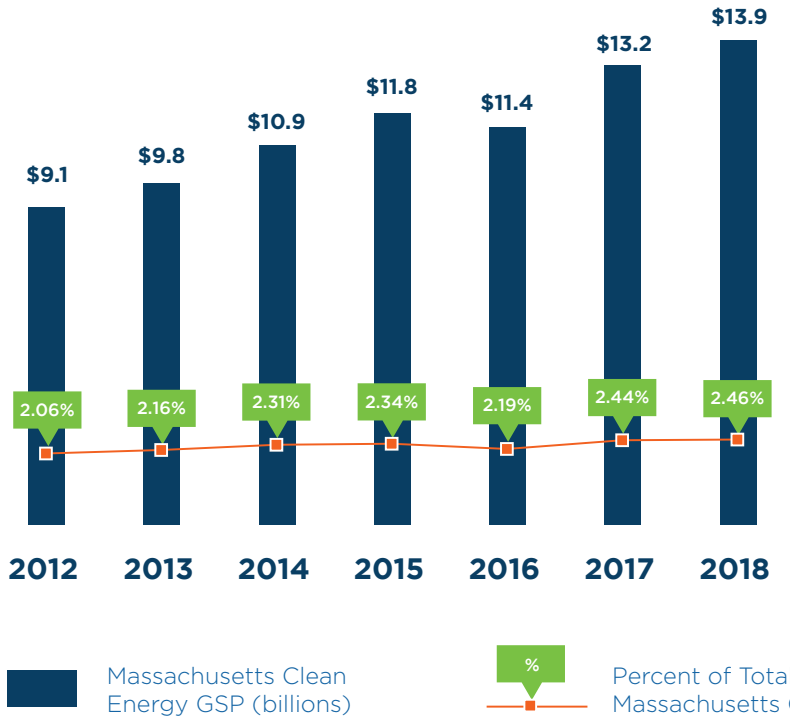
MassCEC New Bedford Marine Commerce Terminal, New Bedford

Clean Energy Gross State Product

The clean energy industry contributed nearly $14 billion, or roughly **2.5%**, to the Commonwealth's Gross State Product (GSP) in 2018.[10]

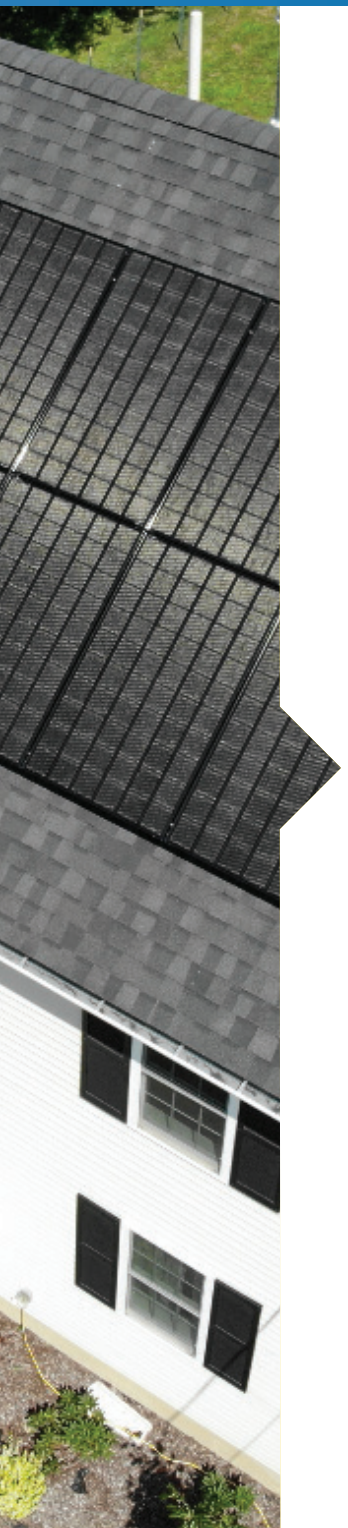
The industry's GSP has increased by **52%** since 2013, which outpaces overall growth in GSP of **28%** over the same time period.

Massachusetts clean energy GSP increased by **5%** (over $748 million) between 2017 and 2018.



[10] *Clean energy GSP was derived from survey incidence rates and proportional revenue reporting, together with existing data from the Bureau of Economic Analysis, calculated by NAICS code. Utility-data and state government spending were included as direct inputs. 2018 is the most recent data available.*

Residential Solar, Worcester

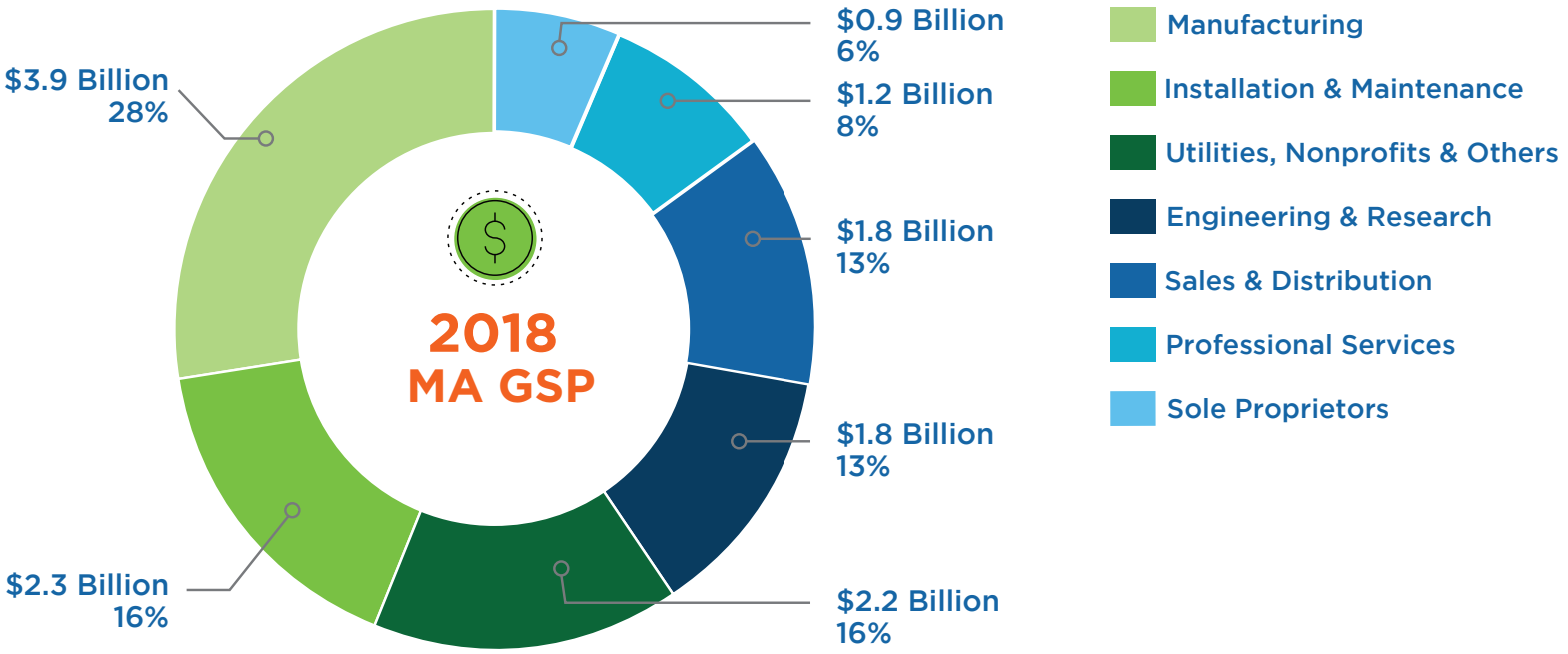


Clean Energy Gross State Product by Value Chain

All categories of the Massachusetts clean energy value chain increased in GSP over the course of 2018.

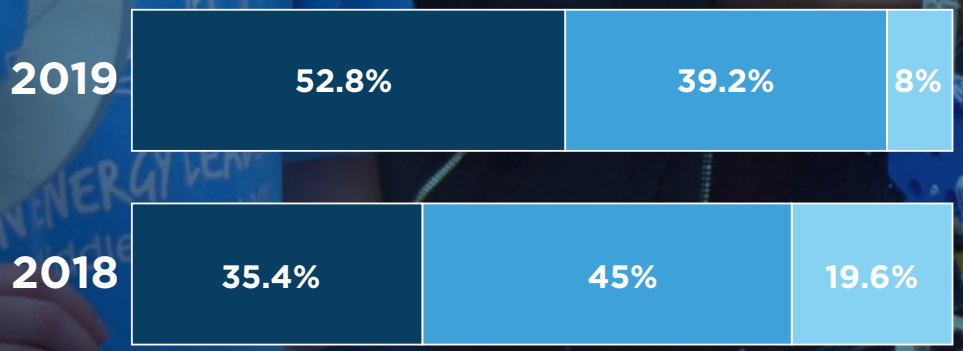
GSP in the Utilities, Nonprofits, and Other category experienced the greatest growth, increasing by **11.5%** over the last year.

Manufacturing makes up the largest portion of the clean energy GSP, followed by Installation & Maintenance and Utilities, Nonprofits & Other.



Reason for New Clean Energy Employees

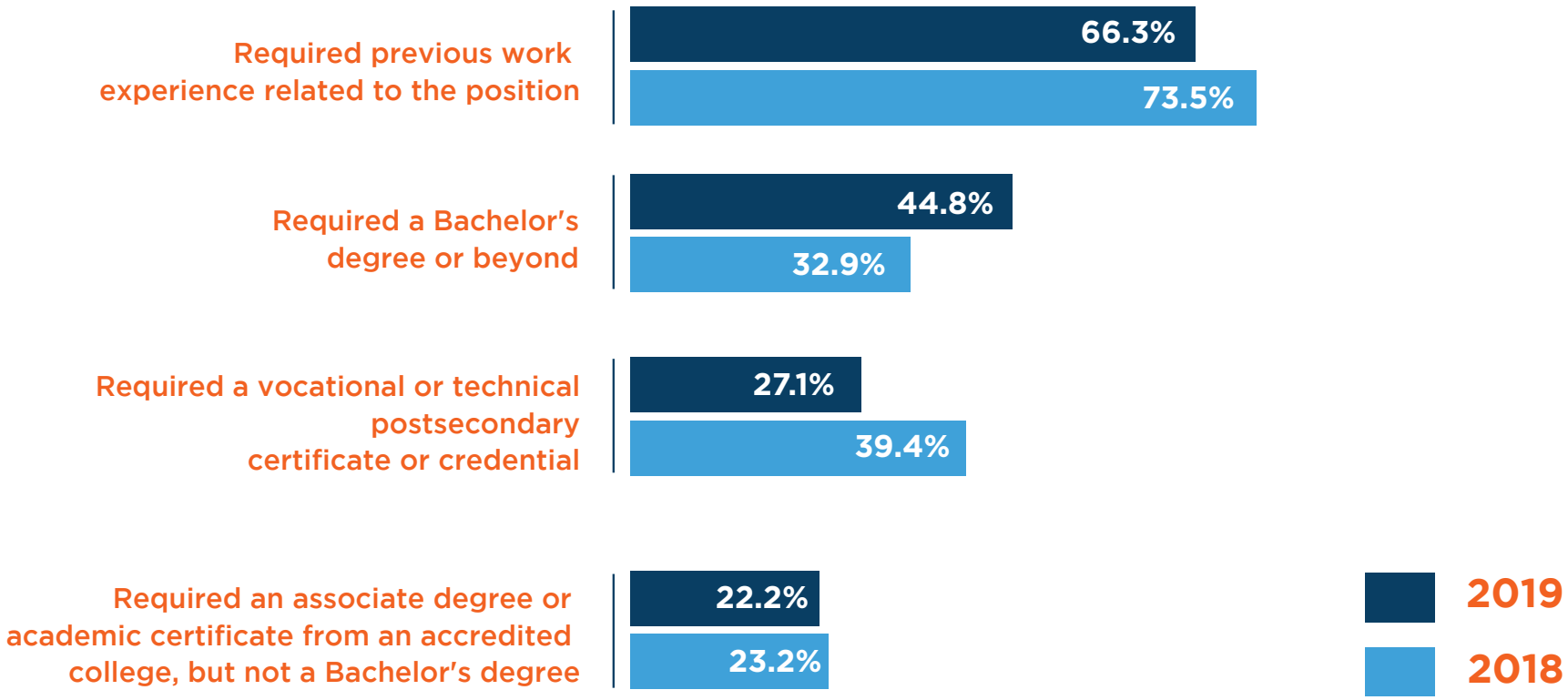
Of new clean energy employee hires, **53%** were for newly created positions in 2019. This is a **17%** increase from 2018.



MassCEC Clean Energy Activity Day, Pierce Middle School, Milton

Educational Requirements for Clean Energy Positions

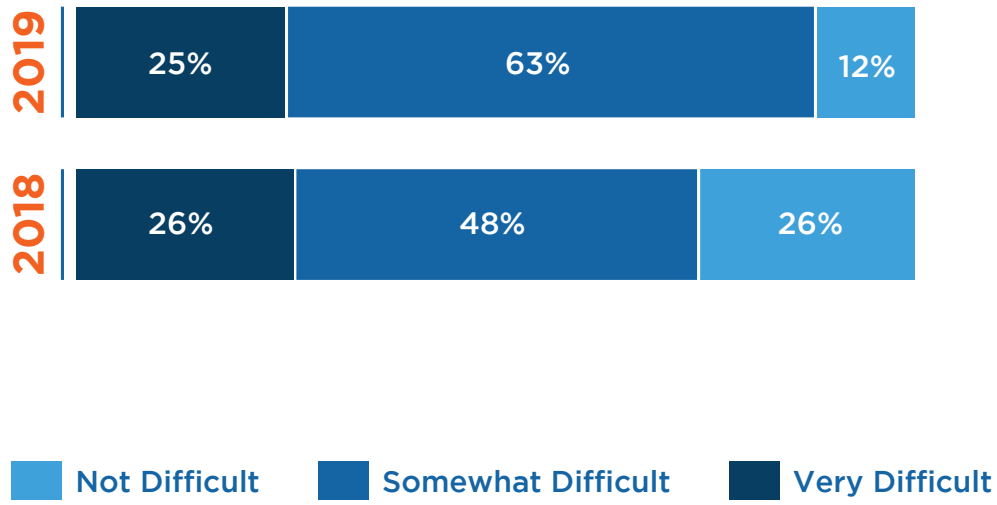
In 2019, **66%** of clean energy jobs required previous work experience, which is down about **7%** from the year prior. There was a **12%** increase in the number of positions that required a Bachelor's degree or beyond, and a **12%** decrease in jobs that required a vocational or technical post secondary certificate or credential. Changes in the educational requirements are likely driven by growth in sectors of the value chain in which jobs are more likely to require a Bachelor's degree.



Employer Difficulty in Finding New Hires 2011-2019

Growth of the Massachusetts clean energy industry, coupled with a low unemployment rate, has led to hiring challenges in the industry.

In 2019, about **88%** of employers reported that it was very or somewhat difficult to find qualified talent, which is an increase from **74%** reporting the same difficulty in 2018.



Residential Air-Source Heat Pump project, Charlestown

Clean Energy Worker Demographics

Massachusetts clean energy workers are diverse, with stronger representation by Hispanic/Latinx, Asian, workers identifying as two or more races, and Veterans than the overall workforce in the state. Women continue to remain underrepresented in the industry. The overall representation of clean energy workers by demographic remained unchanged from 2018 to 2019.[8,9,10]

	Hispanic or Latinx	Black	Asian	Two or More Races	Women	Veterans	Workers Over the Age of 55	Union
2019 Clean Energy Jobs	19,229	8,359	9,888	9,607	33,473	12,294	15,714	8,284
Percent of 2019 Clean Energy Workforce	17%	8%	9%	9%	30%	11%	14%	7%
Percent of 2019 Overall MA Workforce	10%	8%	7%	1%	51%	4%	24%	14%

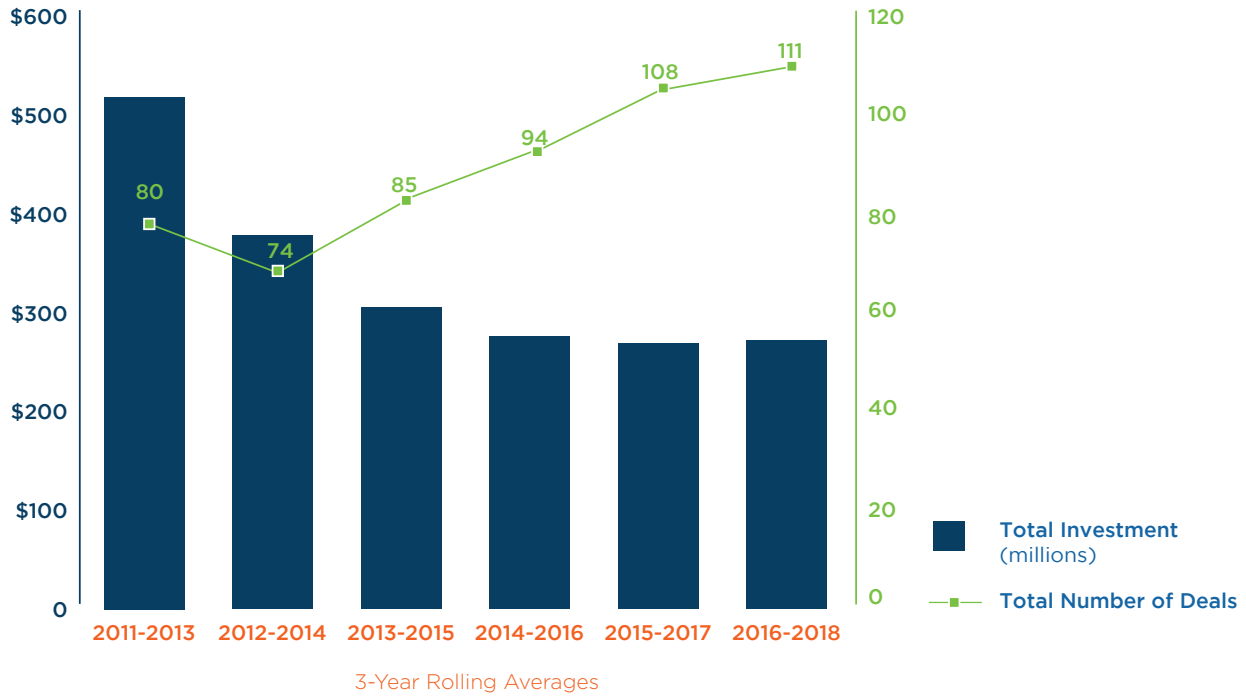
[8] *EMSI data for age, race, ethnicity, gender.*

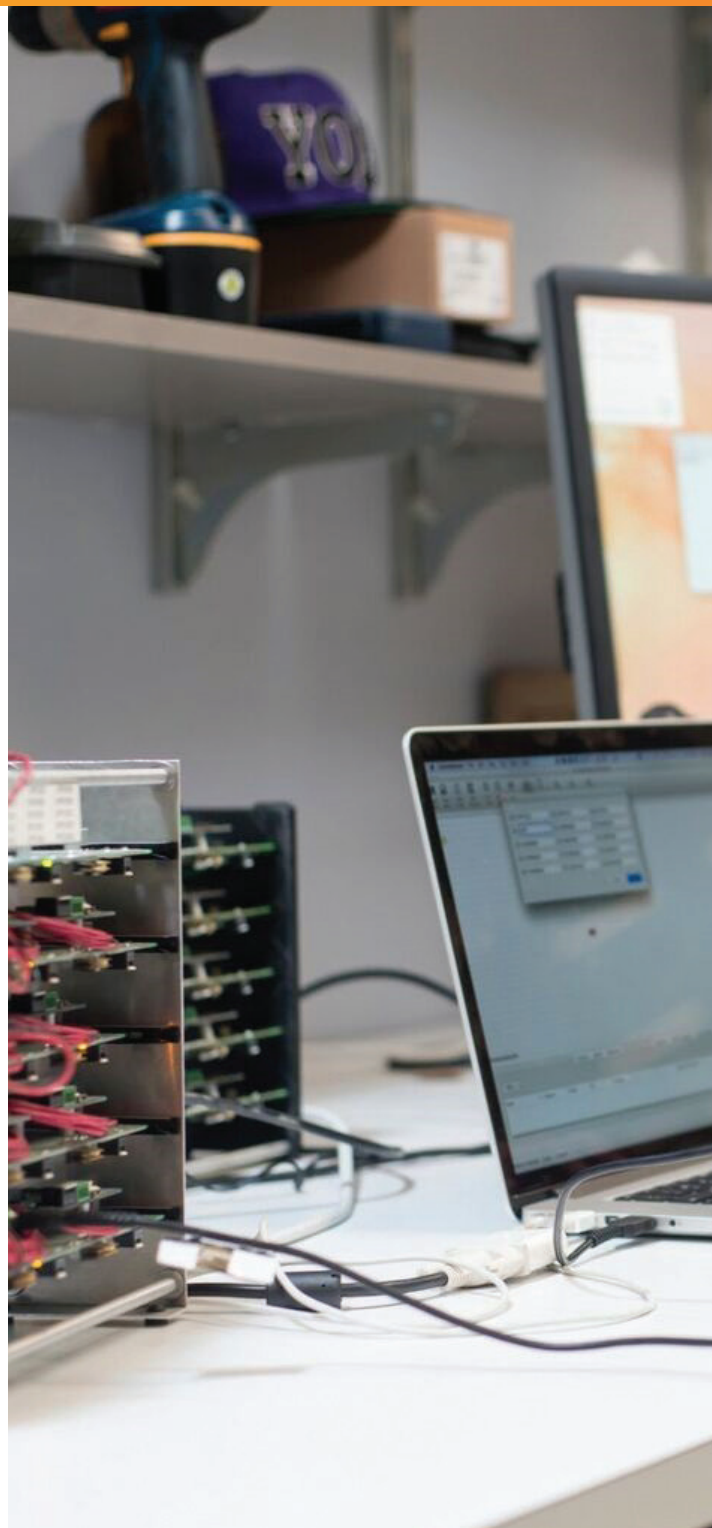
[9] *Union employment rate: https://www.bls.gov/regions/new-england/news-release/unionmembership_massachusettsandconnecticut.htm.*

[10] *Veterans employment: https://www.bls.gov/news.release/vet.t06a.htm.*

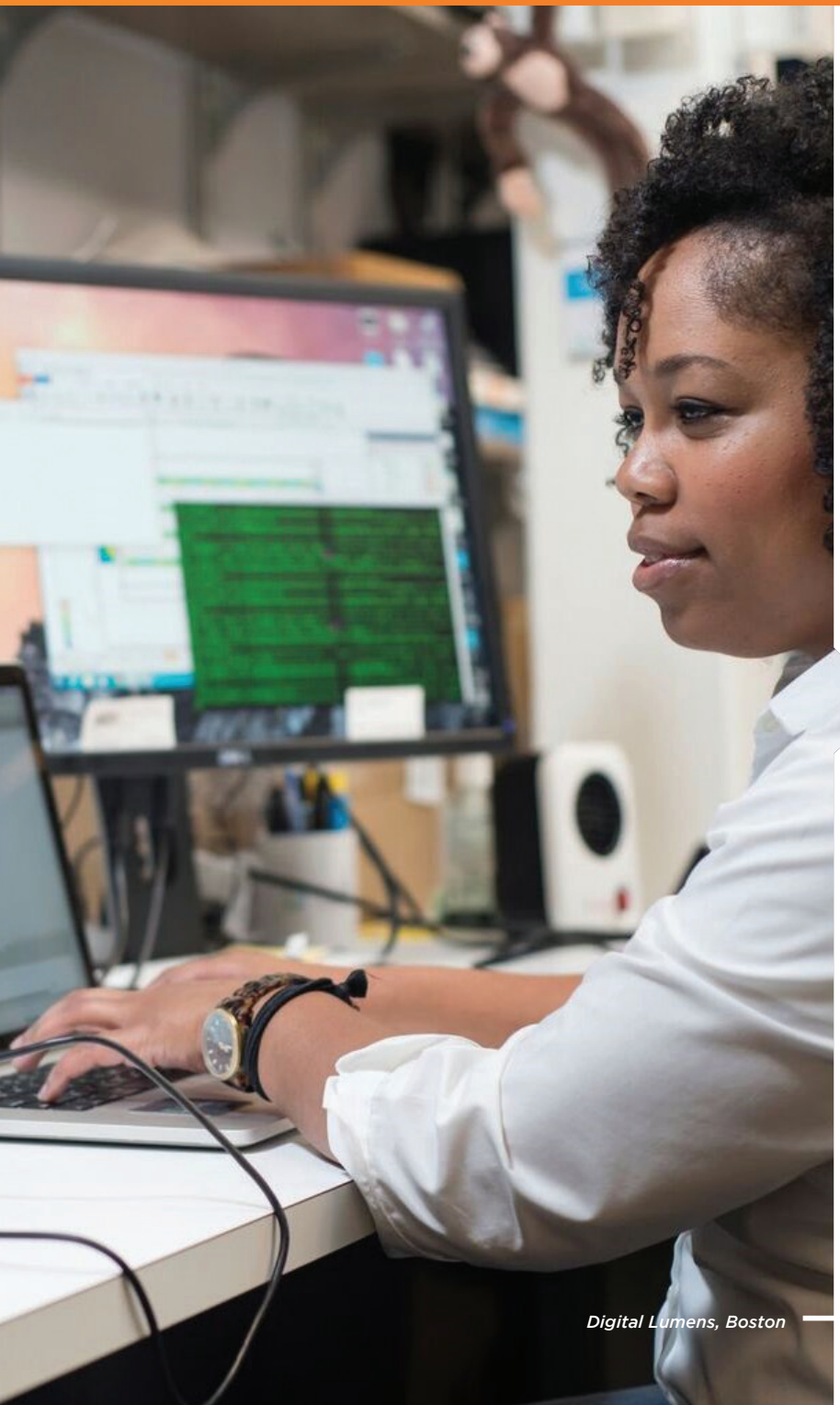
Total Clean Energy Investments

Public funding for clean energy investments in Massachusetts decreased while private funding increased slightly during the most recent 3-year rolling average. Overall investment funding has remained relatively flat, while the number of deals has continued to increase.[11]





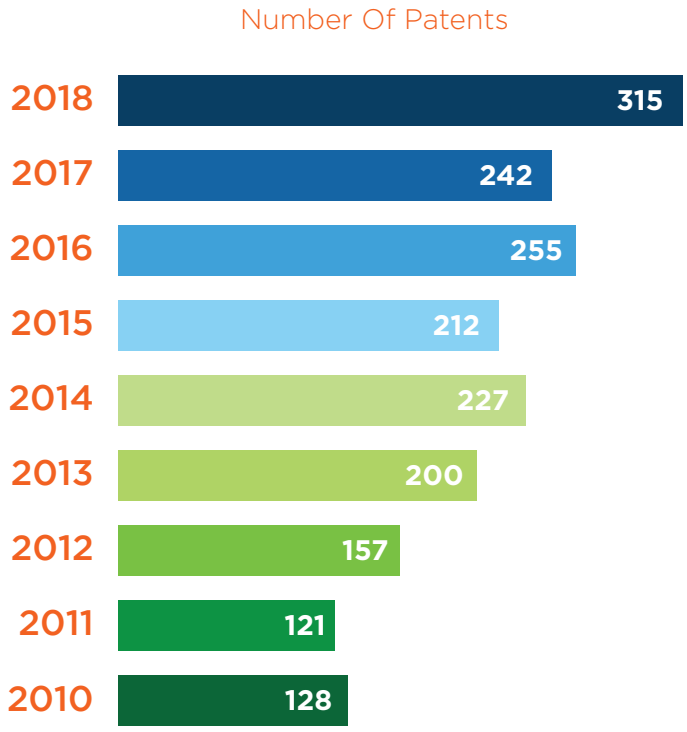
[11] *Sources include ARPA-E, The SunShot Initiative, SBIR and STTR, MassCEC grant funding, the Office of Science and the Crunchbase database.*



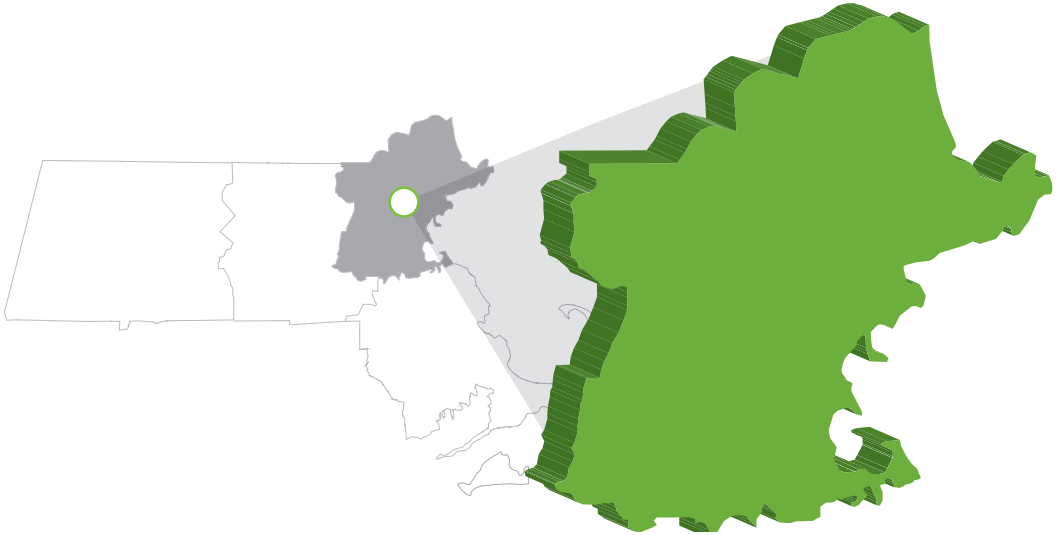
Digital Lumens, Boston

New Clean Energy Patents

Patents across time are an indicator of innovation. Clean energy patents from Massachusetts have increased by nearly **144%** since 2010 and **29%** since 2017. This has been driven by a significant increase in both Alternative Transportation and Renewable Energy patents, growing by **64%** and **135%** respectively.[12]



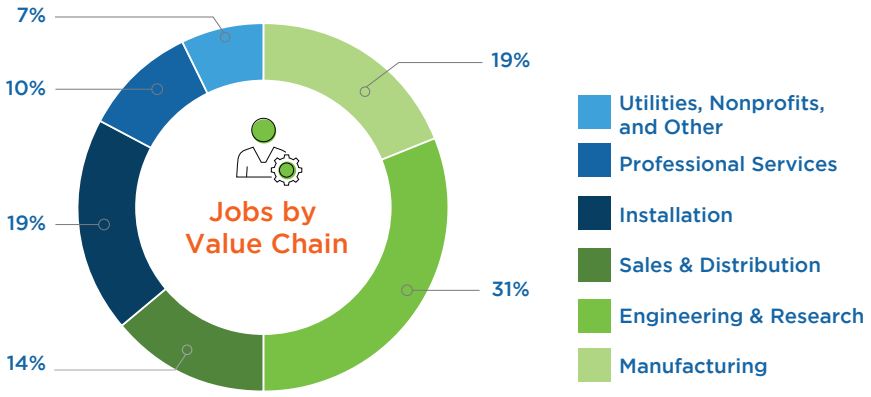
[12] *PatentsView. United States Patent and Trademark Office.*

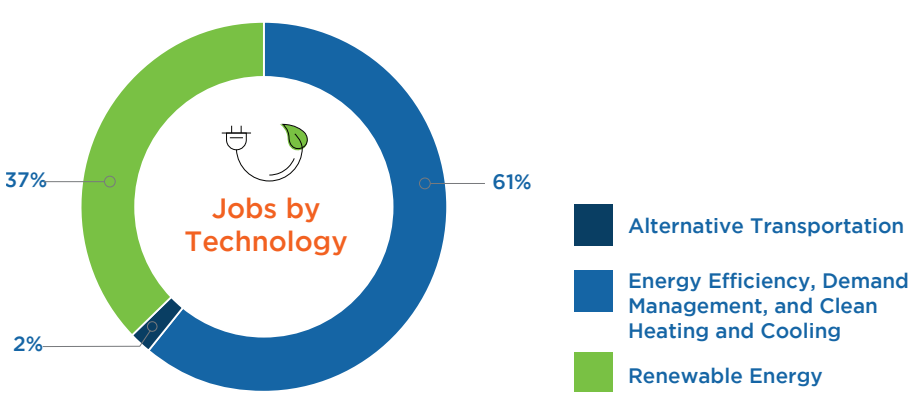


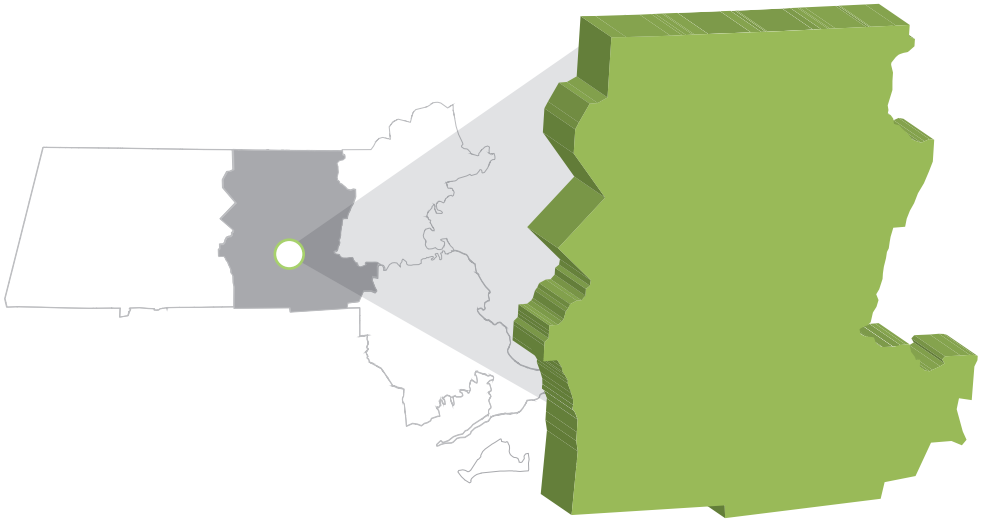
Northeast Region

The Northeast region employs over **48%** of clean energy workers and is home to **45%** of clean energy businesses. Over **31%** of the jobs in the region are in Engineering and Research and **37%** are in Renewable Energy.

	Jobs	Businesses
2018	53,339	3,249
2019	53,940	3,337
% of 2019 Clean Energy Total	48.2%	45.2%
2018-2019 Growth	1.1%	5.2%
Clean Energy Jobs/ Businesses per Total in Region	2.7%	3.0%



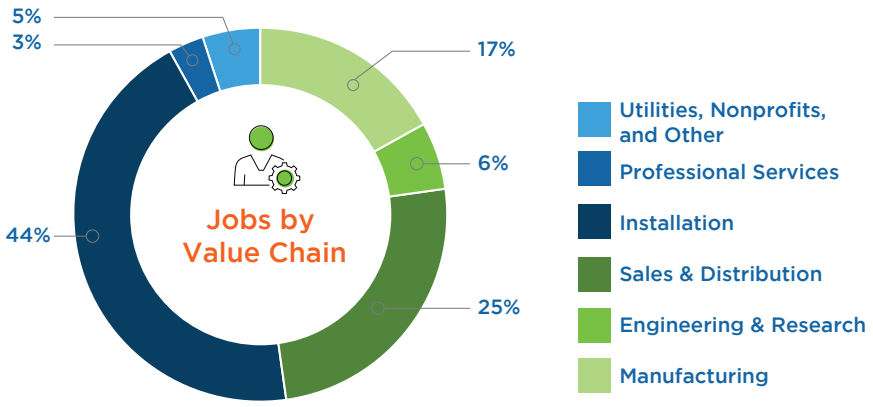


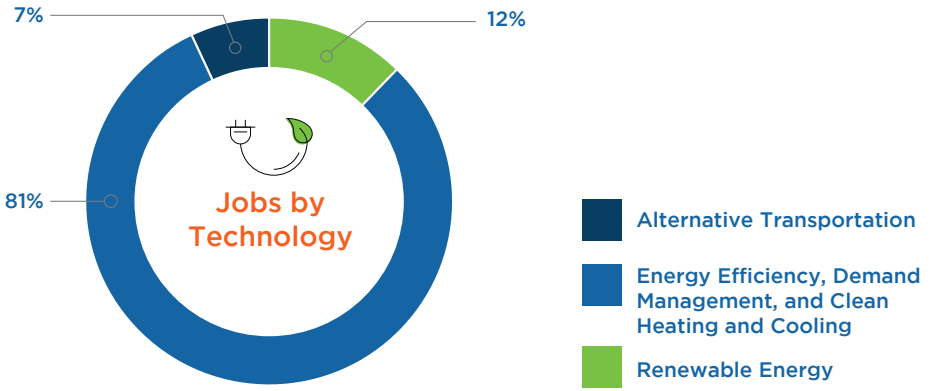


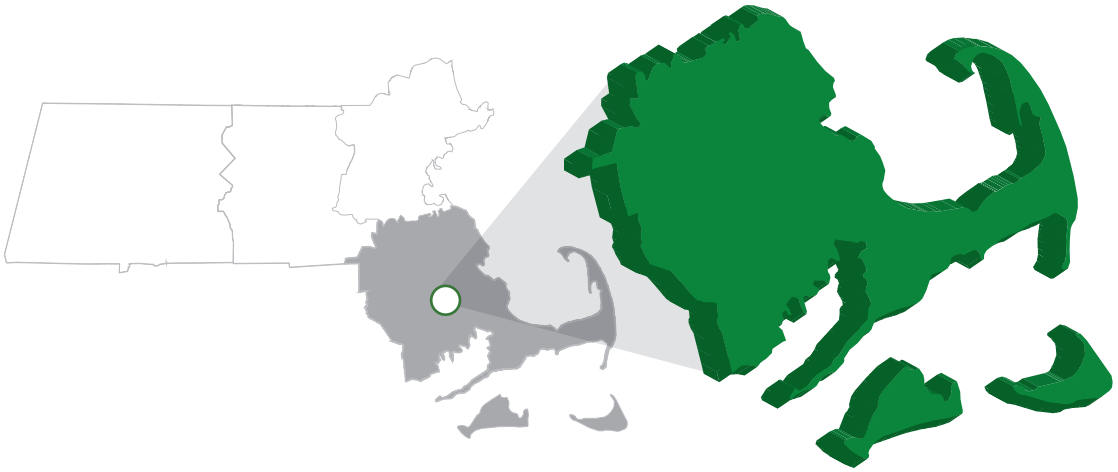
Central Region

The Central region employs the largest percent of clean energy employees and businesses, relative to the total number of jobs and businesses in the region, at **4.1%** and **4.5%** respectively. **7%** of clean energy jobs are focused on Alternative Transportation and **44%** of clean energy jobs in the region are in Installation.

	Jobs	Businesses
2018	18,246	1,140
2019	18,259	1,174
% of 2019 Clean Energy Total	16.3%	15.9%
2018-2019 Growth	0.1%	3%
Clean Energy Job/ Businesses per Total in Region	4.1%	4.5%



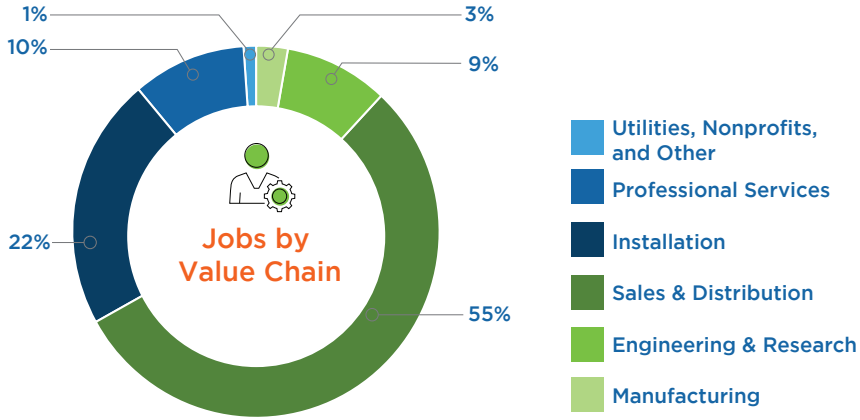


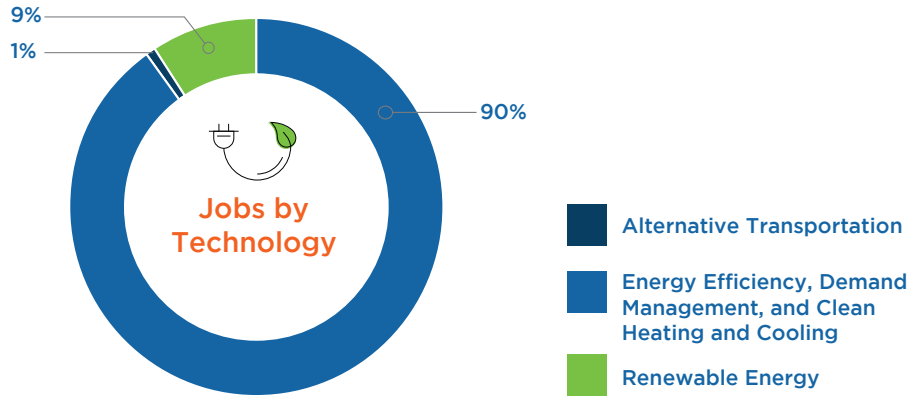


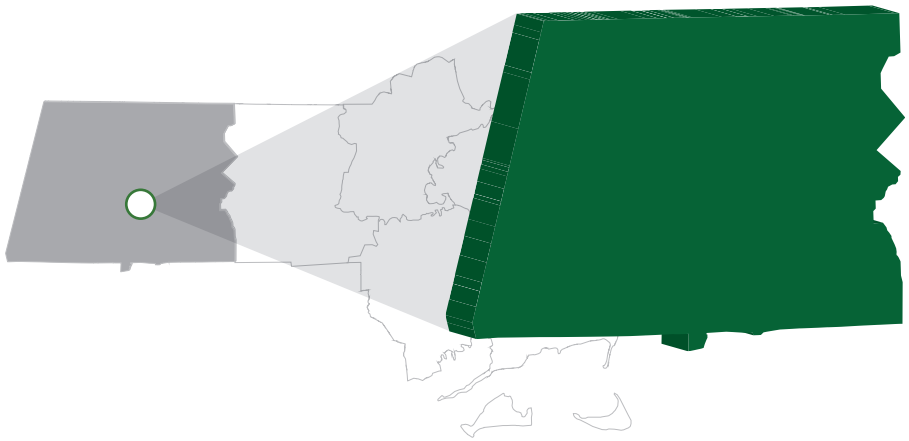
Southeast Region

The Southeast region saw the highest rate of clean energy job growth at **1.5%**. Over **55%** of clean energy jobs are in Sales & Distribution and **90%** of jobs are focused on Energy Efficiency, Demand Management, and Clean Heating and Cooling.

	Jobs	Businesses
2018	25,916	1,748
2019	26,295	1,788
% of 2019 Clean Energy Total	23.5%	24.2%
2018-2019 Growth	1.5%	1.9%
Clean Energy Job/ Businesses per Total in Region	2.9%	2.5%



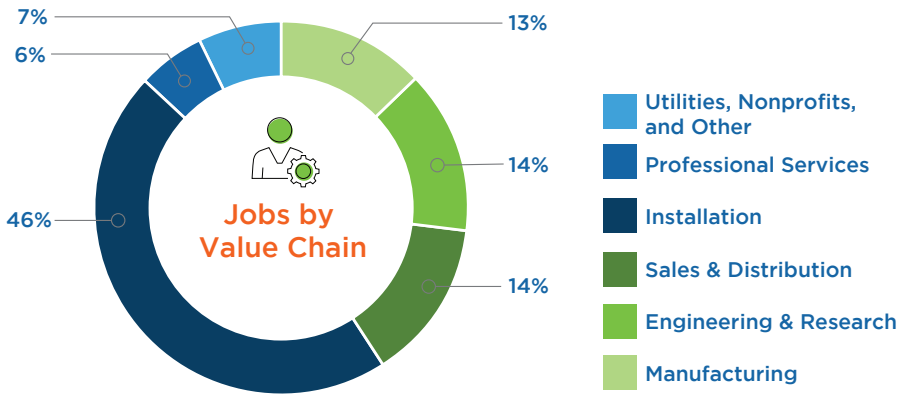


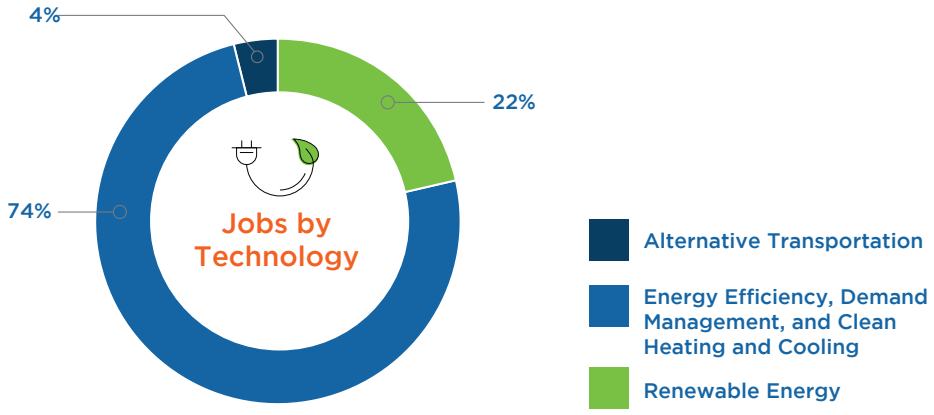


Western Region

The Western region had the second highest growth in clean energy businesses at **3.2%**. Over **46%** of the clean energy jobs are in Installation and **74%** of jobs are focused on Energy Efficiency, Demand Management, and Clean Heating & Cooling.

	Jobs	Businesses
2018	13,266	1,071
2019	13,342	1,079
% of 2019 Clean Energy Total	11.9%	14.6%
2018-2019 Growth	0.6%	3.2%
Clean Energy Job/ Businesses per Total in Region	3.5%	3.4%





Methodology

The Massachusetts 2019 Clean Energy Industry Report uses publicly available data from the 2019 U.S. Energy and Employment Report (USEER) on Massachusetts energy employment produced by BW Research Partnership for the Energy Futures Initiative (EFI) and the National Association of State Energy Officials (NASEO). The full 2019 USEER report can be found at: **https://www.usenergyjobs.org**. These public data are refined and customized for Massachusetts based on additional analyses conducted on behalf of the Massachusetts Clean Energy Center by BW Research Partnership.

The 2019 USEER survey in Massachusetts resulted in more than 13,800 calls and about 660 emails, with 616 business establishments participating in the survey. These responses were used to develop incidence rates among industries as well as to apportion employment across various industry categories in ways currently not provided by state and federal labor market information agencies. The margin of error is +/- 4.88 percent at a 95 percent confidence level.

For more details on the methodology specific to the 2019 Massachusetts Clean Energy Industry Report, please see: **https://www.masscec.com/2019-massachusetts-clean-energy-industry-report**.

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